# Bridging the Gap:
## Science Communications at Lava Beds National Monument

Sarina Patel, Mosaics in Science Intern, Summer 2014


## Summary

Under the terms of the 1916 "Organic Act," the mission of the National Park Service is twofold – to steward iconic and significant landscapes for the enjoyment of the people, and to preserve these landscapes such that they remain a pristine living museum for all future generations to enjoy. In the summer of 2014, Lava Beds National Monument hosted an internship designed to bridge these two pieces of the park service mission, which are often functionally separated between the Interpretive and Resource Management Divisions. Twelve weeks were spent working with the Physical Science division of Resource Management in two capacities: participating in on-going field projects and producing scientific guides, fact sheets, and other communication materials for recently completed projects.

The largest field project involved refining and implementing an inventory and monitoring (I&M) protocol for a sample set of thirty-one of the Monument's 700+ lava tube caves. These caves represent a valuable and highly sensitive resource. They are home to fourteen species of bats as well as hosts to cool, moist microclimates which support vegetation, invertebrates, and other fauna otherwise incompatible with the desert highland climate of the California interior. The I&M program is designed to record the status of life in these caves for the next fifty years, in order to track the impacts of human usage and the effects of climate change on factors such as ice levels, humidity, and species present.

The goal of communication materials was to translate the technical and highly detailed data in the scientific literature into concise concepts accessible to staff and visitors who may or may not have significant scientific training. These materials were aimed at increasing knowledge of the active work (including the I&M protocol) being done to protect and preserve the natural and cultural resources of the Monument, ensuring the most up-to-date information is available and used by the park's Interpretive staff, and bringing the landscape alive for all staff and visitors at the Monument. Improving communication between the Resource Management and other departments is integral to the realization of the Park Service mission in the most comprehensive and far-reaching way as possible.


## Physical Science

The Illustrious, Intrepid Physical Science team

Resource Management at Lava Beds National Monument is divided into the Cultural, Invasive Species, YCC, and Physical Science divisions, plus a variety of other projects managed under no particular title. This internship was spent primarily with the Physical Science division:

### Projects:

#### Inventory and Monitoring

The Inventory and Monitoring (I&M) program at Lava Beds National Monument is one of six park programs within the regional Klamath Network. Lava Beds monitors in five categories: Caves, Exotic Species, Landbird Communities, Land Cover and Land Use, and Terrestrial Vegetation. The bulk of this internship was focused on the seven sub-parameters of the 'Caves' category.

#### Cave I&M

Lava Beds NM contains the largest known concentration of lava tube caves anywhere in the contiguous United States. The ecosystems in these uncanny underworlds contrast sharply with that of the dry scrubland of the surface. When it reaches triple-digits heat in the summer, deep inside the caves you may very well find a floor of ice. The cold, moist darkness of the lava tubes supports a unique and fragile ecosystem. In recent decades, however, scientists and park staff have observed dropping ice levels in many of the caves, as well as changing air flow and nutrient loading as a result of human alterations. The Cave I&M protocol is aimed at tracking changes in seven aspects of cave ecosystems in order to better gauge the effects of climate change and human presence on this exquisite, sensitive natural resource.

#### The Seven Parameters:

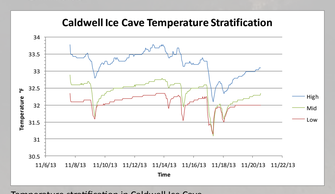
Invertebrates

Adult male gryllobattid in Cox Ice Cave

Scat and Visible Organics

Grey Fox Scat growing a spectacular mold in a back-country cave

Climate

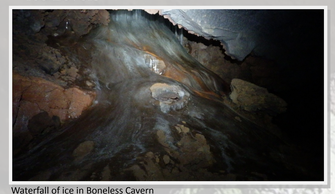



Temperature stratification in Caldwell Ice Cave

Human Visitation

Researchers checking for a bat maternity colony in Captain Jack's Ice Cave

Ice Levels



Waterfall of ice in Boneless Cavern

Bats

Myotis bat in Labyrinth Cave

Entrance Vegetation

Carpet of spreading moss in the entrance of Post Office Cave

Background Image: Transect photo for a back country cave taken as part of the I&M Cave Entrance Vegetation Surveys

## Never a Dull Moment

Working for the National Park Service turned out to be more than just a job. Whether it's going back into the field after dinner to survey the outflight of a bat maternity colony you found earlier in the day, spending a Saturday off running activities for Junior Ranger Day, hosting an employee potluck dinner once a week, or setting up a sprinkler system in the middle of the night to protect staff housing when a wildfire breaks out, the lifestyle of a Park Service employee is just that—an all-hours lifestyle. It requires you to work hard, and not always for compensation. But the perks make the buy-in easy. Working at a National Monument has meant I always have a hiking buddy, there's always someone up for a weekend adventure to another park, the stars are unreal, and I wake up every day to absolute beauty just outside my window. My work is meaningful, there is always something new to learn, and my co-workers care genuinely about what they do.

The lightning strike-started Caldwell Fire, burning just short of two miles from the park staff housing area in the midst of a dry lightning storm. A team of fire-fighters approaching the fire appear as a moving star in the black basin. Photo credit: Nico Ramirez, 2014.


A) The view doesn't get much better than from a hammock strung up to overlook the basin and Schonchin Butte, the park's most iconic cinder cone peak

B) Refilling Mt. Shasta's ash-cloud supply before triggering a mock eruption at Junior Ranger Day

C) Ross Chimneys is full of spatter ramparts and hollow cones ripe for exploring during time off

D) Collecting cave entrance vegetation data at the mouth of Sentinel Cave

E) Sparkling hydrophobic microbes coat the walls and ceiling of Hopkins Chocolate Cave, giving it the appearance of being adorned with gold and silver

F) Living on the border between California and Oregon means stunning new places to explore, like Crater Lake, are never too far away

## Ohana Means Family

I went to Lava Beds for a work experience. What I got was an unparalleled life experience. The field work, the writing, the meetings, and trainings all taught me more than I ever imagined I could get out of a twelve-week position. I was given every opportunity to acquire new skills, see new places, design my own projects, and explore to my heart's content. But more than that, I was encouraged and supported by some of the most superb supervisors the National Park Service has to offer. Despite being one of the youngest staff members on one of the shortest contracts with some of the least experience, and an intern to boot, I was told that my voice matters, and I was given respect and responsibility. On and off work time, I was included into a family built strong and true on trust, good humor, a mutual love for the job, and genuine care for the well being of others. I was prepared before I arrived for the possibility of a summer spent mostly in solitude. That misnomer was dispelled the first night I arrived. Twelve weeks, in the end, has been far too short.

## Communications Projects:

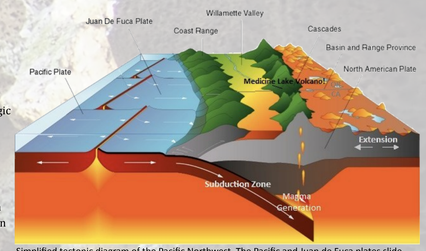
### Geology of Petroglyph Point Guide

Petroglyph Point is a sacred site for the native Modoc people. Before the 1902 Reclamation Act and the draining of the lake, this tuff cone used to be surrounded by water. The Modoc would canoe to its base and carve petroglyphs into the soft rock, which remain visible today. Geologically, Petroglyph Point is unlike most of the lava and cinder-built formations in the park, having been produced via phreatomagmatic eruption. Many of the tour guides at Petroglyph Point have strong backgrounds in history but limited science knowledge. Based on data in the 2014 Geologic Resources Inventory Report for the park, this double-sided fact sheet was designed to explain the unique and dynamic geology of this feature in a manner legible by the staff giving the tours and to provide them teaching tools which they can employ in their programming.


Aerial view in Google Earth of the tuff cones and tuff ring, including Prisoners Rock , which hosts Petroglyph Point, which formed concurrently in a phreatomagmatic eruption. This image was featured as a explanatory diagram in the guide provided to Interpretation.

### Rock Talk Fun Fact Sheet

Just this April, the National Park Service released a new Geologic Resources Inventory report for Lava Beds NM, containing comprehensive, peer-reviewed, up-to-date data on all major geologic features within the park boundaries. Some of the information is common knowledge to anyone who spends much time at the Monument, but some hidden gems did come through. Aimed at adding to the general knowledge of the staff at the Monument and helping staff feel more connected to the land they steward, a fact sheet for park-wide distribution was compiled. Topics ranged from the unique tectonic setting of the Monument on the border between the Cascade Volcanic Arc and the Basin and Range physiographic province, to the Modoc relationship to the land, to the fossilized history of fauna in the area (mastodons, jaguars, and bighorn, oh my!).




Simplified tectonic diagram of the Pacific Northwest. The Pacific and Juan de Fuca plates slide beneath the North American continent, producing many kinds of landforms, including the Cascade Volcanoes. Image adapted from http://blogs.canby.k12.or.us and was included in the fact sheet distributed to staff.

### I&M Bulletin and Webpage

One of the largest projects the Physical Science Division has undertaken is the Inventory and Monitoring program for significant natural resources in the park. This summer was dedicated in large part to piloting the first of a 50 year project to monitor seven aspects of cave ecology in a sample set of 31 of the Monument's 700+ caves. This protocol is a key method for tracking the effects of human visitation, climate change, and management decisions on the park's natural landscape, and will impact how the monument's natural resources are managed for the next fifty years and into the future. The Bulletin and Webpage were built to give the public a glimpse of the work going on behind the scenes to preserve the intrinsic beauty of the landscape and the health of the ecosystem for visitors today and in the future to enjoy.

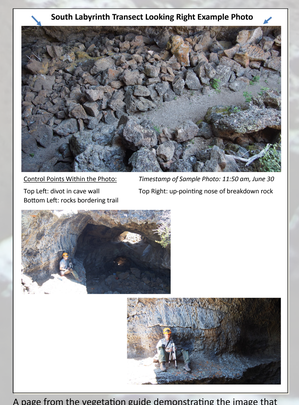

A) Outflight of a Brazilian free-tailed bat maternal colony, the park's largest, with a trial automated counting program applied

B) A wildlife cam catches a shot of the Physical Science team counting inverte-brates by a lava stalagmite in a back-country cave.

C) Marchantia polymorpha, aka "Lung Liverwort," growing at the entrance of Captain Jack's Bridge

### Vegetation Photo Monitoring Guide

One of seven parameters for the Cave I&M program involves a photo monitoring program of the unique vegetation which grows in the cool and moist microclimates in the entrances of the caves. This year was the pilot year for photo monitoring, and much of the summer was spent clambering in and around the cave mouths to find the best, and most easily reproducible, photo points to capture changes in flora over the next 50 years. The instructions to locating these photo points, setting up the camera in each location, and reproducing the original image occupies a guide roughly 300 pages in length.




A page from the vegetation guide demonstrating the image that needs to be reproduced with arrows indicating useful features for lining up the shot and photos of the camera location.